Japanese Patent Application, First Publication Nº H4-213826

Int. Cl.[5]: H01L 21/304
B08B 3/12

Publication Date: 4 August 1992

Title	Wafer Cleansing Apparatus for Semiconductor Production
Application Nº	H2-401233
Filing Date	11 December 1990
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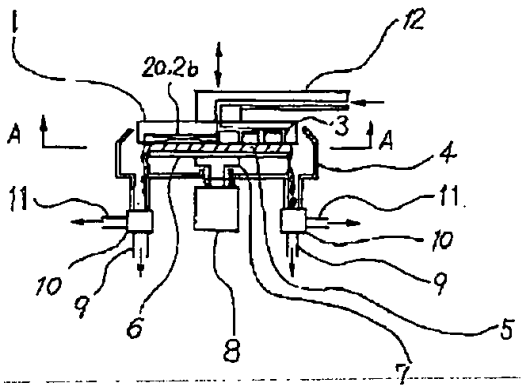
ABSTRACT

Structure - An ultrasonic cleansing unit 1 capable of moving in the vertical direction is provided above a wafer 6 being cleansed, this ultrasonic cleansing unit 1 having ultrasonic oscillator portions 2a, 2b and a pure water supply portion 3 on a surface opposing said wafer, wherein ultrasonic vibrations are transmitted to the wafer through pure water supplied to the wafer from this pure water supply portion 3, to strip adherents away from the wafer surface for cleansing.

Effects - Since the entire surface of the wafer can be uniformly cleansed by ultrasonic vibrations contaminants on the wafer surface can be removed without contacting the wafer and without generating static electricity. Additionally, the contaminants at fine step portions of the wafer surface can also be removed.


1
12
20.2b
A
3
A
4
11
11
10
10
9
9
6
8
5
7

CLAIM

A wafer cleansing apparatus for semiconductor production, for feeding pure water over a wafer and cleansing in single-wafer fashion; the wafer cleansing apparatus for semiconductor production being characterized in that an ultrasonic cleansing unit capable of moving in a vertical direction is provided above said wafer, and said ultrasonic cleansing unit has an ultrasonic oscillator portion and a pure water supply portion on a surface opposing said wafer.

DETAILED DESCRIPTION OF THE INVENTION

[0001]
Field of Industrial Application

The present invention relates to a wafer cleansing apparatus for semiconductor production, and particularly relates to a single-wafer type wafer cleansing apparatus.

[0002]
Conventional Art

Conventional single-wafer type wafer cleansing apparatus, as shown in the plan view of Fig. 4, have a flow means comprising two lanes A and B, each of which sends wafers 6 housed in respective wafer carriers 23 through wafer carrier stations 21a and 21b to a cleanse processing portion 24, where the cleansing is performed, after which they are conveyed to the wafer carrier and load stations 22a and 22b. Figs. 5 and 6 are a vertical section view and plan view of a cleanse processing portion. As shown in Fig. 5, the cleanse processing portion comprises a pure water nozzle 18 for ejecting pure water 5, a high-pressure pure water nozzle 25 for compressing pure water and ejecting it at high pressure, a rotating brush 17 and a brush driving portion 26.

[0003]

Next, a cleansing operation shall be explained. First, a wafer 6 which has been conveyed is centered and raised by a wafer chuck 7 by means of vacuum suction, then rotated by the chuck rotating motor 8 while pure water 5 is ejected from the pure water nozzle 18. Next, the rotating brush 17 is lowered by the brush driving portion 26 along a brush vertical movement direction 19, and brought into contact with the wafer 6, whereupon contaminants are removed from the wafer surface due to the scrubbing of the brush which is rotated in the brush rotation direction 19. After the rotating brush has been retracted, the wafer is rinsed once again with te pure water nozzle 18, and after the rinse, is rotated at high speed to throw off the moisture, then conveyed to the receiver. In the conventional art, this cleansing format is called the brush scrub format.

[0004]

As another cleansing format, there is the jet cleansing format in which a brush is not used. This is a format for removing contaminants wherein, instead of removing contaminants with a brush scrubbing, compressed pure water is ejected onto the wafer by the high-pressure pure water nozzle 25.

[0005]

The above-described cleansing operation is performed inside the processing cup 4, the waste fluid is gas-liquid separated in a gas0-liquid separating portion 10, and expelled through the exhaust portion 11 and drain 9.

[0006]
Problems to be Solved by the Invention

Since a rotating brush of a resin material such as nylon or rayon is used in such conventional single-wafer type wafer cleansing apparatus, it is difficult to adjust and control the pressure and amount of the brush being pressed, and moreover impossible to remove contaminants from fine irregularities on the wafer surface, as well as the problem of pieces of the brush adhering to the wafer. Additionally, during the ejection of pure water from the high-pressure nozzle, the contact between the pure water and wafer becomes very fast, thus generating static electricity, thereby giving rise to such problems as the electrostatic destruction of device patterns on the wafer and readhesion of fine contaminants due to the static electricity.

[0007]
Means for Solving the Problems

The wafer cleansing apparatus of the present invention is provided with an ultrasonic cleansing unit capable of vertical movement above the wafer for performing a cleanse in single-wafer format, the surface of this ultrasonic cleansing unit opposing said wafer having an ultrasonic oscillating portion and a pure water supply portion. Pure water fed onto the wafer from this pure water supply portion transmits ultrasonic vibrations to the wafer, thereby removing adherents from the wafer surface to perform the cleanse.

[0008]
Embodiments

Next, the present invention shall be described with reference to the drawings. Fig. 1 is a section view of a cleanse processing portion according to an embodiment of the present invention. Fig. 2 is a perspective view at the arrows A-A thereof. The present embodiment shall be described based on the operations thereof.

[0009]

When a wafer 6 is taken up by the wafer chuck 7 and begins to rotate, the ultrasonic cleansing unit 1 composed of an ultrasonic oscillator portion 2a, 2b and a pure water supply portion 3 positioned above the processing cup 4 is lowered by the ultrasonic cleansing unit moving arm 12, and stopped at a position which is a tiny distance from the wafer 6. Next, enough pure water to completely fill the area between the wafer 6 and the ultrasonic cleansing unit 1 is fed by the pure water supply portion 3. Next, ultrasonic vibrations are generated by the ultrasonic oscillator portion 2a, 2b, the contaminants on the wafer surface are stripped by the ultrasonic vibrations transmitted through the pure water, and the contaminants are removed by the pure water which is being constantly fed. At this time, the wafer 6 is being rotated, thus enabling ultrasonic vibrations to be applied uniformly over the entire surface of the wafer, thereby allowing the entire surface of the wafer to be evenly cleansed.

[0010]

Additionally, by making the oscillation frequencies of the ultrasonic oscillator portions 2a, 2b different, the cleansing effect can be largely improved even in cases where there are steps or fine gaps between the wafer surface portion and device pattern.

[0011]

Fig. 3 is a section view of a cleanse processing portion according to Embodiment 2 of the present invention. The arm driving portion 13 for driving the ultrasonic cleansing unit moving arm 12 attached to the ultrasonic cleansing unit has a drive control portion 14 for fine reciprocation action, and a pure water supply quantity control portion 15 for maintaining the change in pure water volume due to changes in the spacing between the unit and the wafer caused by reciprocal action of the ultrasonic cleansing unit 1.

[0012]

This is a mechanism for introducing a reciprocal motion of $\lambda/2$ of the oscillation wavelength λ in order to prevent the generation of standing waves and the consequent reduction in cleansing ability due to attenuation of the ultrasonic waves when the spacing between the ultrasonic oscillator surface and wafer becomes an integer multiple of $\lambda/4$ of the oscillating wavelength λ, thereby to ensure that the cleansing performance is always stable. As a result, the entire surface of the wafer can be evenly cleansed.

[0013]
Effects of the Invention

As described above, the present invention has an ultrasonic cleansing unit provided on the cleanse processing portion, which enables the entire wafer surface to be uniformly cleansed by ultrasonic vibrations, and has the effect of being able to remove contaminants from the wafer surface without contacting the wafer and without generating static electricity. Additionally, since the cleanse is performed by ultrasonic vibrations, it also has the effect of being able to remove contaminants even if the surface is stepped due to device patterns on the wafer.

BRIEF DESCRIPTION OF THE DRAWINGS

[Fig. 1] A section view of a cleanse processing portion in Embodiment 1 of the present invention.

[Fig. 2] A view along the arrows A-A in Fig. 1.

[Fig. 3] A section view of a cleanse processing portion in Embodiment 2 of the present invention.

[Fig. 4] A plan view showing the overall structure of a conventional cleansing apparatus.

[Fig. 5] A vertical section view of a cleanse processing portion in a conventional cleansing apparatus.

[Fig. 6] A plan view of Fig. 5.

[Description of Reference Numbers]

1	ultrasonic cleansing unit
2a, 2b	ultrasonic oscillator portion
3	pure water supply portion
4	processing cup
5	pure water
6	wafer
7	wafer chuck
8	chuck rotating motor

9	drain
10	gas-liquid separating portion
11	exhaust portion
12	ultrasonic cleansing unit moving arm
13	arm driving portion
14	drive control portion
15	pure water supply quantity control portion
16	fine reciprocal action
17	rotating brush
18	pure water nozzle
19	brush rotation direction
20	brush vertical movement direction
21a, 21b	wafer carrier station
22a, 22b	wafer carrier and load station
23	wafer carrier
24	cleanse processing portion
25	high-pressure pure water nozzle
26	brush driving portion

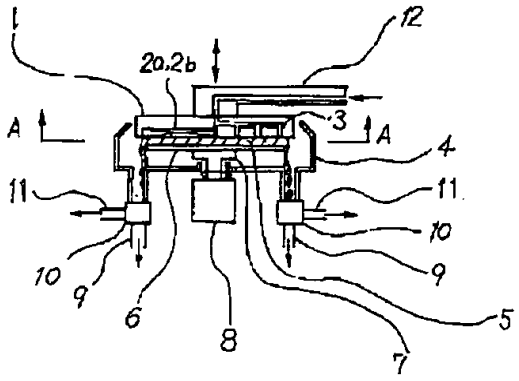


Fig. 1

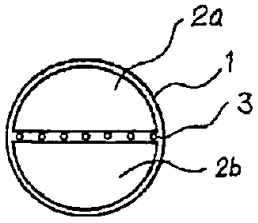
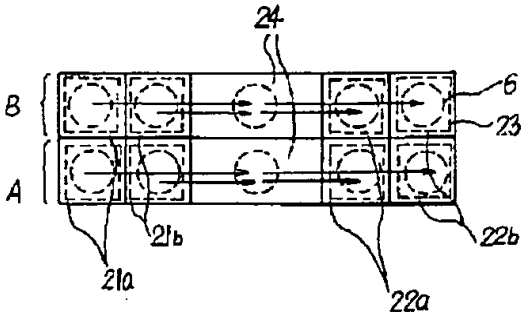


Fig. 2



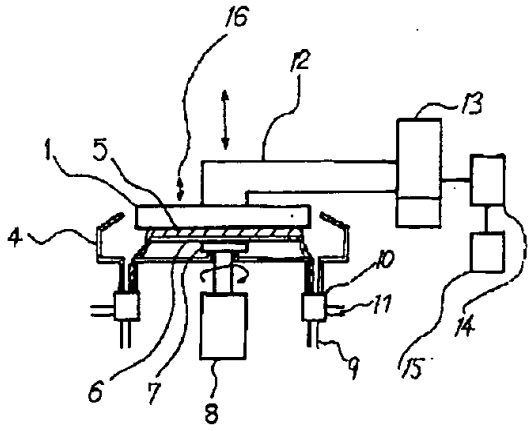


Fig. 3

Fig. 4

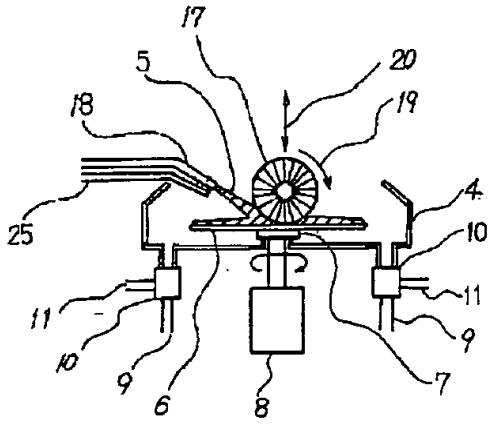


Fig. 5

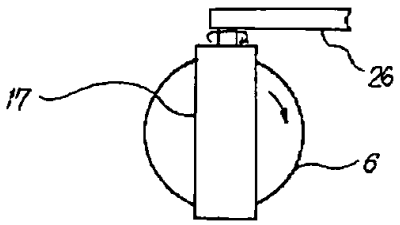


Fig. 6